the outflow of a carbon star rich in the acetylene (C_2H_2) molecule. Observations of additional interstellar lines of sight through diffuse interstellar medium dust and additional laboratory experiments aimed at the questions posed in this study will be the next steps along the path toward identifying the hydrocarbons in the diffuse ISM. Dust from the diffuse ISM is incorporated into dense molecular clouds, out of which the next generation of stars and planetary systems form. Identification of the diffuse ISM hydrocarbons, which appear so similar to those seen in carbonaceus meteorites, is important to pursue.

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The SOFIA Water-Vapor Monitor

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The Stratospheric Observatory for Infrared Astronomy (SOFIA), a 3-meter class telescope mounted in a Boeing 747 aircraft, is being developed for NASA by a consortium consisting of the University Space Research Association, Raytheon E-Systems, and United Airlines. This new facility will be a replacement for the retired Kuiper Airborne Observatory that used to fly out of Moffett Field. As part of this development, NASA Ames Research Center is providing an instrument that will measure the integrated amount of water vapor seen along the telescope line of sight. Since the presence of water vapor strongly affects the astronomical infrared signals detected, such a water-vapor monitor is critical for proper calibration of the observed emission. The design of the water-vapor monitor is now complete, and engineering model units (EMUs) have been constructed for all of the important subassemblies.

The SOFIA water-vapor monitor measures the water-vapor content of the atmosphere integrated along the line of sight at a 40-degree elevation angle by making radiometric measurements of the center and wings of the 183.3-GHz rotational line of water. These measurements are then converted to the integrated water vapor along the telescope line of sight. The monitor hardware consists of three physically distinct subsystems:

1. The radiometer head assembly contains an antenna that views the sky, a calibrated reference target, a radio-frequency (RF) switch, a mixer, a local oscillator, and an intermediate-frequency (IF) amplifier. All of these components are mounted together and are attached to the inner surface of the aircraft fuselage, so that the antenna can observe the sky through a microwave-transparent window. The radiometer and antenna were ordered from a commercial vendor and modified at Ames to include an internal reference calibrator. Laboratory tests of this subassembly have indicated a signal-to-noise performance over a factor of two better than required.

2. The IF converter box assembly consists of IF filters, IF power splitters, RF amplifiers, RF power meters, analog amplifiers, analog-to-digital (A/D) converters, and an RS-232 serial interface driver. These electronics are mounted in a cabinet just under the radiometer head and are connected to both the radiometer head and the water-vapor monitor CPU. Engineering model units for all the important components in this subassembly, including the entire RF signal chain, the RF detectors, and the low-noise power supplies, have been constructed and tested in the lab. All easily meet their allocated performance requirements.

3. A host CPU converts the radiometer measurements to measured microns of precipitable water and communicates with the rest of the SOFIA mission and communications control system. A nonflight version of this computer has been procured for development and laboratory testing, and the software architecture has been defined. Coding of prototype software has started, and communications between the host CPU and the IF converter box assembly have been demonstrated.

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